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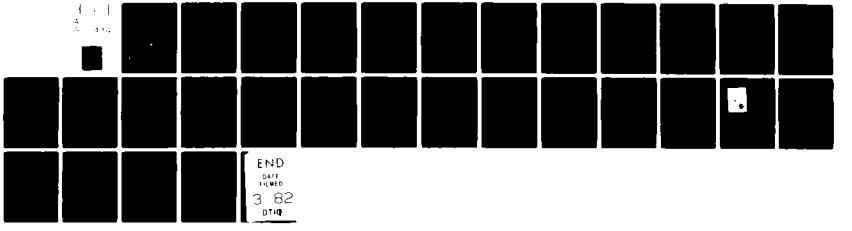

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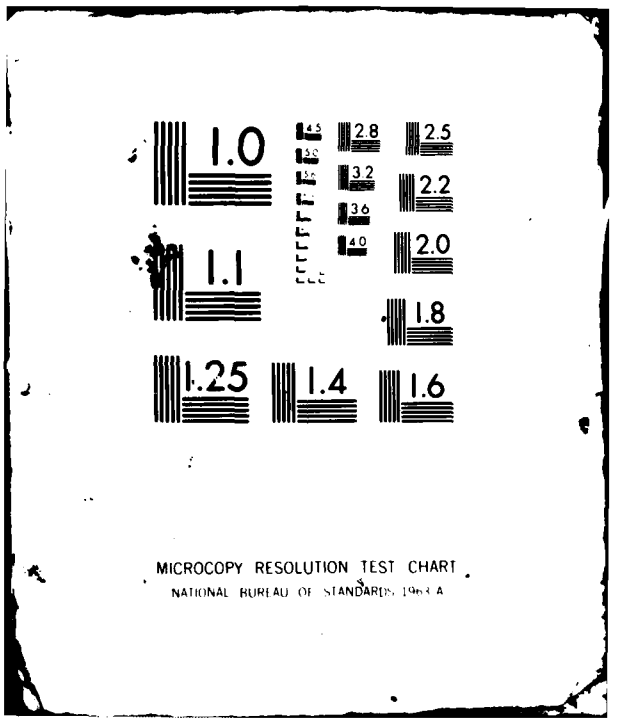
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This is a monthly publication presenting brief articles concerning recent developments in European Scientific Research. It is hoped that these articles (which do not constitute part of the Scientific Literature) may prove of value to American scientists by calling attention to current developments and to institutions and individuals engaged in these scientific efforts.

The articles are written primarily by members of the staff of ONRL and occasionally articles are prepared by, or in cooperation with members of the

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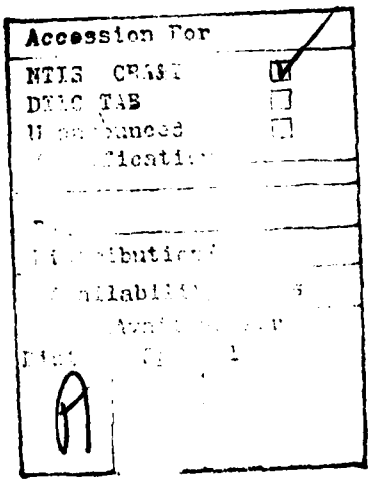

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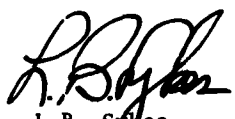

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BEHAVIORAL SCIENCES

THE COD WAR AND HUMAN PROTECTION AGAINST COLD

A prevailing cliché is that wars, despite the multifold misery and tragedy they bring, often encourage innovations of lasting benefit to mankind; for instance, WWII is often credited with mass application of new drugs, new insecticides, and new medical and logistic techniques. From recent British studies reported by LT M. Chandler of the Royal Navy Medical Services, the war doesn't have to be a full-fledged shooting affair to produce good R&D; in fact, Britain's rather low-key "cod war" with Iceland gave rise to improved personal protection against cold weather and cold water.

The waters off Iceland constitute the most important UK fishing ground, and for a half century or more this fishery has produced an average British catch of around 170,000 tons per year. A total of about 190 British vessels fish the area, and three British fishing ports are nearly totally dependent on the Icelandic catch. A serious dispute over Icelandic-area fishing arose in the early 1970s, when the Government of Iceland extended its zone of economic interest from 12 miles (from baseline shore) to 50 miles. The dispute continued for many months. On occasion, Icelandic coastguard boats used cutting equipment to sever the net-holding apparatus on British trawlers, resulting in collisions and rammings. There were several other provocatory incidents, and some shots were fired; the developments led to the deployment of Royal Navy vessels in the area. (Eventually, Britain and Iceland agreed to ship and catch limits in the area, and so the safe supply of fish and chips was assured.)

When there were Icelandic rammings of Royal Navy or British commercial ships, compartments were often partially flooded. Repair crews might have to stand and work for a long time in water at near-freezing temperatures. For centuries, seafaring men have worked in such environments and have accepted it as a necessary part of life at sea. Although certain people, such as those in diving, rescue work, and flight-deck operations, have always received special and expensive clothing, it seems that little change has been made in ordinary seaman's work clothing, except to color it orange. To provide some cold protection to the "cod fleet" a new low-cost waterproof garment of polyurethane-coated nylon was designed and tested in a simulated cold-water task. In an experiment the new garment produced a mean rise of skin temperature of 5°C or more, compared to a control group wearing ordinary clothing, and this difference remained steady over a 35-min work cycle. Also, the men who did not have protective suits shivered all the time, and in most non-suited subjects shivering became uncontrollable after 20 min; none of the suited men shivered at any time and they appeared to be warm and comfortable. The problem may sound simple and manageable, but it took the cod war to produce a solution to it.

Another problem, partially thermal in nature, was the design of a standard life raft. For the new 25-man raft, which replaced the old 20-man model, various changes were made to reduce the effects of cold. One of these was a low seat, which raised the buttocks of the raft occupants off the floor of the raft; tests showed that this raised buttock temperature by several degrees. Other changes were made to the raft canopy to provide better dead-air insulation. The improved canopy closures raised ambient raft temperatures by 5 to 10°C, but they also led to toxic CO_2 buildup within 30 min or so. It was found that opening a lookout port for 10 min every half hour reduced CO_2 to non-toxic levels.

Disabling cold injuries in wars have been widely distributed and devastating; while the Napoleonic 1812 withdrawal from Russia is perhaps the most famous case, more recent wars have had the same problem. As an example, the US 8th Air Force, operating in Europe in 1943, had more casualties from frostbite than from combat. And during WWII in Europe the US Army had 91,000 casualties from the cold; of these only 15% returned to full active duty, and the mean hospitalization time was 50 days. Looking at the relatively straightforward recent advances in cold protection, it seems that even a small amount of research attention to such problems can have a massive payoff.

Nicholas A. Bond, Jr.

ONR London

DECISION-AIDING SOFTWARE IN VOCATIONAL GUIDANCE

Vocational decisions are among the most important choices made by the individual and they are often very difficult. Sometimes the difficulty is informational. A person simply does not know his own aptitudes and interests, and he may also be fairly ignorant of the opportunities available,

his perceived likelihood of success in each one, and the subjective satisfactions that might accrue to him from actual work in different careers. American surveys show, for instance, that young people raised in rural areas may have never seen an economist, an anthropologist, or a statistician at work, and so such careers are seldom contemplated by those who live in the country. In principle, such information gaps can be managed by appropriate testing, publicity, and counseling programs.

But there is a second kind of difficulty in vocational decision making, and that is the sheer amount of information processing required by each individual. Even though the decision maker has ample information, there will be many perceived payoffs and probabilities to assemble, and these can vary on several correlated dimensions. Faced with such an array of data to organize and process, the individual may select only a few key dimensions, make rough evaluations of those, and then elect the first reasonably acceptable alternative. No wonder that so many actual career choices seem to be made on the basis of chance factors such as an encounter with a charismatic teacher or a summer job.

For this second kind of difficulty, it is conceivable that decision-aiding systems could be of assistance in managing some of the complexity. One can envision a minicomputer terminal that would encourage the decision maker to provide certain key dimensional and probabilistic inputs about career options and that would print out an ordered array of options. There is certainly ample precedent for such interactive decision aids; the Harvard Business School package of programs, written in BASIC, has been used for some years to estimate probabilities and utilities in the Schlaifer-Raiffa decision framework.

At the Decision Analysis Unit of Brunel University in the UK, Patrick Humphreys and his associates have been working on a career decision aid. Humphreys assumed from the outset that any aiding system would have to be operable by people who were innocent of computer or decision theory, because such people are the usual customers of vocational counseling services. The Brunel researchers already had produced a general decision-aiding program called MAUD (for Multi Attribute Utility Decomposition). That program had worked rather well for relatively sophisticated users in several contexts such as selection of television commercials and allocation of funds to arts projects by a local government committee, and so it was hypothesized that, when modified for use by computer-naive people, it might be useful in the vocational-choice domain. Also, MAUD had gone through several modifications, so that MAUD 3 was the current version when the vocational choice project got underway.

The idea behind MAUD is to operate upon the client's inputs; to get started, the computer asks the client to list from 4 to 10 choices that are perceived to cover a reasonable range of job alternatives. Then the computer asks for attributes or evaluative dimensions that are meaningful to the client in the decision context. The practical ends or "poles" of these dimensions are also defined. In the next step, the computer asks the client to rate all the alternatives on a subjective scale between these poles, and it also requests the decision maker to indicate a preferred or ideal point on the scale. The computer program then takes the elicited ratings and rescales them so that the least preferred alternative receives a score of 0 and the most preferred has a score of 1.

Suppose a MAUD-aided decision maker has reached the point at which a set of zeroes and ones has been obtained. The computer now has stored the beginnings of a preference structure, for one individual, but the structure may be technically defective or incoherent. For example, it is desirable that the scaled ratings should exhibit conditional utility independence, that is, preferences for values in one dimension should be orthogonal to values in another dimension. The MAUD program checks for correlation among sets of ratings, and if non-independence is detected, then a program loop attempts to eliminate or redefine dimensions so that independence is achieved.

Once a suitably coherent structure has been attained, MAUD proceeds to elicit tradeoff values between the dimensions; this is done by asking the decision maker to choose between reference gambles or "BRLTs" (Basic Reference Lottery Tickets). These assessments offer a choice between (a) a p% chance of getting an alternative that is best or positive polar in both of two dimensions with a (1-p)% chance of getting an alternative that is worst on both variables, and (b) a sure bet of getting an outcome that is best in one dimension and worst in the other. Systematic application of the procedure yields an indifference point, and from these indifference points utilities across dimensions can be estimated.

As the final step in the aiding process, MAUD "puts it all together" and prints out a final preference ordering for the scaled dimensions and BRLTs. It also prints a summary of the scaled ratings of each

dimension separately as well as a summary of the BRLT choices. Seeing all of these parts of the decision structure set before him, a decision maker may well choose to make some changes in the structural elements; MAUD permits this. MAUD also can do "sensitivity analysis"; if a set of dimensional values seems uncertain or unreliable, then the decision maker can conduct "excursions" of the values to determine how much change would be required to result in a substantially different preference ordering.

How do you evaluate a system like this? There is no objective criterion, so one must look to such criteria as logical consistency and acceptability to the user. As MAUD flows directly from additive-rule decision theory, we can quickly agree that the system is logically sound within that theory. There are several things to be evaluated regarding acceptability. You can ask how easy it was to use the system, whether the structure of the decision problem is better than it was previously, and so forth. MAUD stood up well on acceptability; for one thing, the system was highly portable, because the program was stored in a portable IBM 5110 computer and was taken to the client's home in about half the cases (it has since been translated into BASIC, for use on Northstar and other microcomputers). Thirteen of the first 15 clients said that they found MAUD helpful. Humphreys observed that, for most vocational clients, the system helps either because the person is confused about what to do and the system helps to focus on things of importance, or because the client has a clear idea and likes to have the computer "confirm" his feelings. A small minority of clients, however, disliked the machine setting and the repetitious scaling of values and gambles and found it hard to isolate variables for intense consideration.

Prof. Ward Edwards (Univ. of Southern California) once proposed that "consciousness raising" was one criterion of an aiding system: if the system forces the contemplation of key issues and tradeoffs, then as a person uses the system there should be increasing convergence between the computed preference ordering and the individual's subjective ordering. This convergence is one indication that the problem structures in the individual's mind and in the computer are approximately the same. While Humphreys does not yet have evidence of convergence between intuitive and MAUD-prescribed orderings in the vocational choice application, there is quantitative evidence from sessions with TV commercial planners, arts grant committees, and the like. In such trials, convergence seems to be highest when the decision maker honestly wants to express true subjective attribute weights; if the decider wants to push or manipulate others to do something because of reasons not associated with true weights, convergence suffers. MAUD can thus be said to "expose" subjective weight conflicts.

As experience with MAUD accumulates, there are at least a couple of non-obvious lessons that planners of military decision aids might notice. One of these is the individuation: there are persistent individual differences in the way people regard an aiding machine. Those who were annoyed at the machine's insistence on comparing variables according to a strict routine often were just those who didn't want to continue with MAUD. There is every reason to think that military decision makers exhibit much of this variability in attitude. One corollary is that, to be used effectively, an aiding system may have to recognize what kind of person is using it, and perhaps it should adjust itself to that person's expectations about the system.

A second point learned from MAUD experience involves the willingness of clients to delete and modify the dimensions of a decision problem. There are several statistical hints in the data that persistent deletion and reconstitution lead to a simple "regret structure"; that is, by deletion and redefinement activities the client tends to see clearly what is being given up in one dimension in order to achieve an (incompatible) gain in another. This regret structure, being simple, is easier for the client to deal with, and its existence is highly correlated with the convergence between the outputs of such schemes as MAUD and intuitive judgment. There are implications here for systems designers; the capability of a system to promote a simple regret structure might be taken as one figure of merit, under some circumstances. And perhaps decision makers should be well trained in achieving simple regret before they are exposed to a decision-aiding system. There are technological problems in identifying regret structures, and decision analysts are working on them. If the trends observed with MAUD continue, then it may turn out that the best decision-aiding software is not necessarily a system for computing the best decision in a specific problem, but is instead a system that makes the users better problem managers and problem structurers in general.

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POSTURAL AFTEREFFECTS AT MANCHESTER

Suppose that a human observer is looking at a fixed point on a large moving display; after inspecting the scene for about a minute, he often has a feeling that he is moving in a direction opposite to the motion on the display. Thus, if the display lines are moving downward, the observer senses that he is moving backwards, and so he leans slightly toward the display. If the motion on the display stops suddenly so that the observer is looking at a stationary visual field, he usually leans back toward the true vertical.

The interesting thing is that, for some subjects, the backward "correction" of the forward lean continues right on through the vertical, so that now there is a backward lean. This is the postural aftereffect; and though it was noticed before by other investigators, James Reason and his colleagues at Manchester University (UK) seem to have been the first to discover the critical conditions for the phenomenon to occur.

Reason's group had their subjects stand on a triangular platform, which was instrumented so that leaning forces could be measured. A display of light stripes (3° subtended) and 5° dark stripes moved downward on a screen at 14° per sec; a small red light was in the center of the moving display, and the observers were instructed to look at this stationary target light all the time.

Ten subjects were originally tested in the setup; two were dismissed because they did not exhibit a forward lean. The eight remaining subjects then went through a Latin-square experimental design that systematically varied the duration of the moving display (5, 30, 60 sec), whether the eyes were open or closed after the induction of forward lean, and whether the subject was prevented from leaning forward by a wooden bar.

Results were rather clear cut: in order for the postural aftereffect to occur, the eyes had to be open and the subjects had to be set for the stimulus to continue for some time after the induction of maximal forward lean. Over the time range investigated, the duration of the visually induced forward lean was not important, but sight of the static display immediately after perceived motion did seem to be necessary.

Eye closure apparently eliminated the aftereffect; but was this due to the eye closure itself, or to a lack of visual information? (Reason's previous work on motion sickness had shown that eye closure affords some protection from sickness in moving vehicles with no windows). In a second experiment, 12 subjects were used; from a starting sample of 17 subjects, 4 did not lean forward and one was nauseated by the moving display. There were three conditions: (1) eyes closed 60 sec after the start of the visual motion; (2) darkness with eyes open but all lights in the room turned off after 60 sec; and (3) eyes open throughout, with room in full illumination. The eyes-open condition was the only one of the three that produced the aftereffect. Thus one can say that the aftereffect is a fairly predictable response in those subjects who experience visually driven leaning followed by viewing of the static display.

Reason explains the aftereffect in terms of an Internalized Model of Body Position (IMBP). The IMBP represents the output from a "comparator" system that correlates all the position and motion cues. Ordinarily these cues are closely matched in veridicality, so no one set of cues predominates. But when the strong dynamic visual scene is observed, this powerful stimulus temporarily overrides the vestibular and joint sensors, probably because in usual circumstances the downward strip-movement pattern is a cue for backward lean from a stationary scene. Near-automatic "corrections" of this (false) backward lean produce the initial forward lean, and they also set in train some proprioceptive reflexes that act against the seen motion and thus against the forward lean. When the display stops, its forward-driving attraction or "force" ceases abruptly, encouraging the backward-leaning movements. There may be a series of mild oscillatory overshoots as the whole system finally corrects to the true vertical.

The difference between eyes open and the two no-vision conditions is attributed by the Manchester researchers to recovery time constants; if the light is suddenly turned off, the transition is from motion to no vision, and the decay in the force of the visual cues pretty well matches the time recovery of the proprioceptive set to move back toward the vertical. But with eyes open and the display illuminated, the switch from motion to no motion is, to the IMBP, a step function, and this permits the now-uncontested corrective (backward) proprioception to go past the vertical.

Using this IMBP conception, Reason conjectures that a gradual slowing of the moving stripes should reduce the aftereffect; indeed, if the time-constant interpretation is valid, the constants for the visual and proprioceptive recovery perhaps could be matched experimentally. Also, it is possible that instead of using

a stopped display for static viewing, an entirely different visual stimulus could be presented at the end of the motion, and this might reduce or even intensify the effect. The experimental results seem reliable enough to encourage some norming studies, and there are interesting issues related to individual differences in susceptibility.

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BIOLOGICAL SCIENCES

CARDIAC REHABILITATION—A WORLD CONGRESS: Part I

This is the first part of a two-part article on the Second World Congress on Cardiac Rehabilitation. The second part will appear in the February issue of *ESN*.

Jerusalem was the venue for the congress, which was held on November 30 to December 3, 1981. The choice of Israel as the site of this important international meeting was largely due to the recognized leadership of Prof. Jan J. Kellermann (Chaim-Sheba Medical Center, Tel-Hashomer, Israel) in this field for several decades. Kellermann served as the president of the congress. The impressive opening session was to have been addressed by the Israeli Prime Minister, Mr. Begin, who unfortunately was hospitalized because of an accident. His private physician addressed the assembly instead, as did the Minister of Health and representatives of several international health and cardiologic organizations. Prof. Nanette K. Weuger, (Emory Univ., Atlanta, GA) spoke for the American Heart Association. Thirty countries were represented by over 350 professional participants. Unfortunately, simultaneous sessions prevented one from hearing all of the presentations, but there was considerable duplication and repetition.

Atherosclerotic and thromboembolic (and vasospactic) diseases of the coronary arteries account for an enormous mortality and morbidity in every country of the world, developing as well as developed. As the importance of personal habits (smoking, diet, exercise) in the pathogenesis and prevention of coronary artery disease has come under investigation and due publicity has been given to these factors, many western countries have arrested the increase in the incidence of heart attacks. However, this is not a universal experience. Cardiac rehabilitation aimed at the relief of cardiac pain (angina), improved functional status of the heart, prolongation of life, and return to work (RTW) or the pre-illness life-style, is an ever-expanding area for clinical practice and research. The field has been enlarged greatly and complicated by the spread of coronary artery bypass graft (CABG) surgery, and much attention was given to this subject by the congress.

The following were some of the important topics elaborated: the effects of exercise and other elements of rehabilitative programs on survival after myocardial infarction, with emphasis on RTW and recurrence of heart attacks; drugs in the management of coronary heart disease; new methodology in the assessment of cardiac function and in diagnosis; psychologic aspects of cardiac rehabilitation; and risk factor modification. Several national programs were reviewed, including the *US National Exercise and Heart Disease Project* and the EHO/Euro Study on Rehabilitation and Secondary Prevention. Among the countries whose representatives described large-scale or national experiences were Australia, Canada, Ireland, Singapore, Israel, West Germany, Norway, and Poland. The complete program included over 200 formal presentations, 19 posters, and 4 luncheon panels. Discussion was generally lively and informative. English was the exclusive language of the congress.

The first plenary session dealt with *coronary surgery as secondary prevention*. (Secondary prevention is prevention in a patient who has known coronary disease. Primary prevention deals with measures taken by those with no diagnosis established, about whom there is no information.) E. Varnauskas (Sweden) posed two questions for the panel of speakers: is the spread of coronary surgery attributable to the "power of the surgeons," and is surgical treatment superior to medical management alone?

H.J.C. Swan (Univ. of California, Los Angeles) pointed out that the major determinant of the outcome of surgery is the magnitude of heart muscle destruction. This can be measured by determination of the "ejection fraction" of the left and right ventricles (LVEF and RVEF). Ejection fraction (EF) is the ratio of blood pumped by one ventricle (stroke volume, SV) to the amount of blood contained in the ventricle before the stroke. Early reports showed no change in EF with surgery. In randomized trials reported by the US Veterans Administration (VA) involving large numbers of men with coronary artery disease, there was no difference in mortality after 30 months when those who had CABG were compared with those who had not. However, Swan showed that longer range follow-up indicated a higher

mortality with medical management alone. With severe left ventricular dysfunction, survival was improved with surgery and EF was increased. (EF is normally 0.5 or greater; patients with severe LV dysfunction show EF in the range 0.2 to 0.3.) The most recent evidence is that surgery alters survival favorably.

Two main coronary arteries, left and right, take off from the aorta to supply the heart muscle. The left branches into two significant vessels, left circumflex and left anterior descending. Thus, coronary artery disease is characterized as one-, two-, three- or four-vessel disease, depending on the number of these large vessels affected. Varnauskas quoted an unpublished European study on survival following CABG. The results were considerably different from the VA study in that the cumulative survival for surgical patients was significantly greater than that for medically managed patients. In general, the difference was greater in proportion to the extent of the coronary disease. Surgery was of no benefit in patients with single-vessel disease, in those with two-vessel disease without disease of the proximal left anterior descending artery, and in those who had no symptoms.

J. B. Borman (Israel) summarized some surgical aspects, noting that surgeons were employing a larger number of grafts per patient, the average now being up to 3.8. Survival is increased with more complete revascularization of the heart. He graded the achievements of surgery as: relief of pain 3+, prolongation of life 2+, prevention of myocardial infarction 2+, improvement of left ventricular function 1+, and suppression of arrhythmias ±.

H. Roskamm (Federal Republic of Germany) described the results of 902 operations. There was 93% survival in 4 years. One year after surgery, angina-free exercise tolerance and maximum exercise tolerance was doubled in most patients, and this persisted for 5 years. Over 50% were back to full-time work in 4 years. US and Scottish RTW figures are higher than those in Germany. This phenomenon was ascribed by several speakers at the congress to the social benefit systems in these countries and raised interesting questions about politics and motivation for RTW. There was a significant correlation between RTW and improved exercise tolerance. The longer the disability existed before surgery, the less likely was RTW after surgery. Thus, earlier surgery may improve chances for successful vocational rehabilitation.

D. H. Spodick (Lemuel Shattuck Hospital, Boston, MA) discussed briefly the declining incidence of coronary artery disease and its mortality in some western countries. He stressed the need for carefully controlled trials f the various modalities of secondary prevention and rehabilitation. This could have been selected as the theme of the congress, for the results of the innumerable statistical studies presented were often quite divergent due to varying experimental design, selection of patients, length and quality of follow-up, variance in definitions, and differing criteria for improvement. This was particularly evident among the many papers from various parts of the world concerning the role of exercise in cardiac rehabilitation.

Weuger reviewed the goals of rehabilitation and stressed the role of the primary-care physician in providing prompt diagnosis, making available prompt revascularization surgery, and encouraging RTW and resumption of an active life-style following heart attack or heart surgery.

Weuger and H. N. Neufeld (Chaim-Sheba Medical Center, Tel-Hashomer, Israel) led an interesting session on early mobilization after myocardial infarction. This problem has vexed clinicians for over 60 years. Indeed, there was a day when strict bed rest for 4 to 6 weeks was enforced for victims of heart attacks, on the assumption that the myocardium needed rest in order to heal.

R. M. Kohn (Buffalo State Univ. of New York) pointed out that there is a high incidence of perioperative myocardial infarction in patients undergoing CABG. Nevertheless, at Buffalo General Hospital all CABG patients, whether or not experiencing an infarction in the perioperative period, are required to sit up 12 hours after the operation, walk to physiotherapy after 48 hours, and engage in regular exercise programs by the fifth postoperative day. There has been no difference in short- and long-term results between those who did and those who did not experience a myocardial infarction. Therefore, Kohn sees no reason to "agonize" over ambulating myocardial infarction patients early, and he urges avoidance of too much bed rest.

R. Messin (Brussels) described his experience with accelerated early mobilization after heart attacks and demonstrated the benefits of shorter hospitalization and earlier RTW. However, his data demonstrated an increased incidence of recurrent myocardial infarction. In the discussion that followed, his observations were sharply questioned. The study was criticized for dealing with a relatively small group of patients, possibly more stressed than is commonly the case.

J. A. Velasco (Spain) summarized the contraindications to early mobilization: shock, congestive heart failure, pain, serious arrhythmia, and fever. The poorest prognosis is for patients over 65 with heart failure and abnormal cardiac rhythms.

The physiologic basis for early ambulation was succinctly reviewed by Weuger. Bed rest "deconditions" through the following alterations: reduced physical work capacity; reduced circulating blood volume, which in turn leads to reflex increase in heart rate and fall in blood pressure when the erect position is assumed; greater reduction in the plasma volume than in the red blood cell mass, leading to increased blood viscosity; reduced lung volume and vital capacity; negative nitrogen and protein balance; reduced skeletal muscle mass, and reduced muscle contractile strength (inefficient muscle requires more oxygen consumption). The benefits of early ambulation for appropriately selected patients are reduction of the above deconditioning effects; reduction in the incidence of thromboembolic complications and pulmonary atelectasis; reduction in the incidence of anxiety and depression; increased functional capacity at the time of discharge from the hospital enabling earlier exercise testing; shorter hospitalization, with its beneficial effects on cost and the availability of beds; and, finally, earlier and more complete RTW.

The US National Exercise and Heart Disease Project was a cooperative, multicenter study of 651 men who had suffered a myocardial infarction and were randomized into an exercise training group (ETG) and control group (CG) for a 3-year study of the effects of prescribed supervised exercise. H. K. Hellerstein (University Hospital, Cleveland, OH) presented the results of the study, which were consistent with substantial benefit from exercise. There were no deaths or significant morbidity associated with exercise. ETG developed significant increase in work capacity, reduced skinfold thickness, reduced plasma triglyceride levels, reduced heart rate and reduced systolic blood pressure. CG experienced decreased work capacity and an increased submaximal working heart rate. The 3-year total mortality was 7.3% for CG and 4.6% for ETG. The 3-year rate for recurrence of myocardial infarction was 7.0% for CG and 5.3% for ETG. Deaths from recurrent myocardial infarction were significantly lower for ETG.

A smaller study, presented by W. A. Seldom (National Heart Foundation of Australia) indicated some success for the rehabilitation program in that country. However, the importance of economic conditions was emphasized, in that the reemployment of cardiac patients is more difficult in times of economic recession and increasing automation.

G. Lamm (Denmark), in presenting the principal findings of the EHO/Euro Study, showed much less clear-cut benefits from "intervention", which included physical exercise, an anti-smoking campaign, dietary measures, and psychologic counselling. Twenty-four countries originally participated in the study, but only 17 centers remained for the final follow-up. Mortality was in favor of the rehabilitation group over the control group, but not very significantly. Non-fatal reinfarctions were less frequent in the rehabilitation group in 8 centers, and less frequent in the control (non-intervention) group in 9 centers. In 15 centers, RTW was more favorable for the rehabilitation group, but this was statistically significant in only 5. This large-scale study failed to show consistent benefits for the rehabilitation program, but there was considerable variance among the protocols used by the various centers. Lamm stressed the need, emphasized earlier, for carefully designed national studies with meticulously followed protocols. Large numbers of patients are required in each center, intervention measures must be applied vigorously and uniformly, and measurement techniques must be as precise as the state of the art permits.

Comprehensive Irish and Asian studies pursued the same theme. C. H. Oon (Singapore) pointed out that his country has possibly the highest morbidity and mortality rates from coronary artery disease in Asia. Unlike the improvements reported in some western countries, there are no signs of abatement of mortality in Asia. Only all cancers, grouped together, exceed coronary artery disease as a cause of death.

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COMPUTER SCIENCES

COMPUTER NETWORK ACTIVITIES AT RUTHERFORD AND APPLETON LABORATORIES (RAL), UK

RAL is the principal Science and Engineering Research Council (SERC) establishment that supports engineering and technology research in UK universities. One of its major research programs in

computer science is the Distributed Computing System (DCS) project reported previously (*ESN* 35-8:298 [1981]). Recognizing the importance of interactive computing in support of basic research, RAL, in conjunction with the Computer Board at the Department of Education and Science, is actively pursuing computer resource sharing among UK universities and research establishments.

Interactive Computing Facility (ICF) Network

The primary objective of ICF is to provide a computer-aided design environment for the academic and research community in the UK. In contrast to the "number crunching" that sometimes characterizes scientific computing, interventions of the designer through interactive systems for decisions, selections of programs and files, and their instant availability are required in the ICF network. When large scientific computation resources are needed, they can be made accessible through the interactive network on the batch basis. There are approximately 30 ICF-purchased computers in the ICF network. The computers are in place at the following establishments: 12 GEC 4000 series computers, distributed among RAL and the universities of Cambridge, Cranfield, Cardiff, Bradford, Birmingham, Bristol, Newcastle and Glasgow; 9 PRIME 550 or 750 systems at RAL, University College, London, the University of Manchester Institute of Science and Technology (UMIST), and the Universities of Surrey, Sussex, East Anglia, Warwick, and Edinburgh. In addition, the DEC PDP-10 at Edinburgh University is the central site serving the artificial intelligence and electronic circuit design applications that are heavily dependent on DEC 10 software, and at RAL three DEC PDP-11/45s, two DEC 11/780s and an interdata 8/32 are shared with ICF by other SERC users. The PRIME 750 computer at RAL also has a Floating Point System AP-120B array processor for signal processing applications. The GEC computers have been fully networked to form the SRCnet (SERC, formerly known as SRC), and they provide protocols for users at one computer to run interactive programs on another computer, transfer files between machines, and establish remote job entry links to batch processing facilities. All these protocols use the SERC version of the standard X25 protocol. The DEC computers are linked to each other via DECnet. A gateway to the SRCnet is provided by RAL to allow access to SERC machines. PRIME computers initially were linked by PRIMEnet, which is very restrictive. New software has been developed at RAL to transfer files from PRIMEnet to SRCnet and to provide remote job entry access to batch facilities. Through the SRCnet, SERC has become the clearing house that supports and distributes new operating systems and applications software for ICF. Collaboration in projects by researchers scattered at several universities has now become a reality. The ICF network is SERC's vehicle in its serious attempt to eliminate duplication of research efforts. Support of PRIME computer software is centralized at UMIST. RAL completed the transfer of responsibility for ICF PRIME user services to UMIST in 1981.

A terminal equipment pool for loans has been set up at RAL. It includes a total of 650 color raster displays, refreshed graphic units, Tektronics storage tubes, plotters, nongraphic display terminals, and assorted printers. Local equipment pools also are available at each ICF computer site. If a grant holder is not situated near one of the local pools, terminals and communication links to the nearest site can be provided by RAL. At present, ICF has 1,700 users in 60 institutions using 30 computers. A rapidly growing body of user-developed application software is being deposited with RAL, which also maintains software documentation standards and configuration control for all ICF software.

Joint Network Team

Under the sponsorship of SERC and the Computer Board at the Department of Education & Science, a Joint Network Team (JNT) was established at RAL in 1979 to formulate plans for the integration of data communication arrangements within and among universities and research council institutes. One of the important elements of JNT's program is the standardization of protocols for terminal-computer and computer-computer communications. International standards (such as X25) are adopted when available. The development work at manufacturers and various computer centers to implement the protocols is funded and monitored by the JNT. Approximately £1 million has been expended to date for the development projects to ensure that the major types of computers in the community are able to support the standard protocols. The long-term objective is to give users access to the processing resources best suited to their applications. It is envisaged at RAL that this will be achieved by a communication hierarchy with local and wide area networks interconnected via gateways.

Projects based on various technologies for local communications are also being supported; they include campus packet switches, Ethernets and Cambridge Rings. The emphasis is on the development of components that could lead to commercial products. Wide area communications under consideration are a proposed regional university network, the existing SRCnet, the British Telecom Packet Switch Service (PSS), and other dedicated links. JNT is examining all these options for a network serving the entire UK academic community.

Other Coordinated Projects

(1) Starlink

Starlink is a project designed to provide a coordinated image processing capability to UK astronomers. The network of Starlink computers interfaces with and has access to a wide range of observational instruments on the ground and in space. Six DEC VAX 11/780 systems are linked in a star configuration with RAL in the center. The five observatory and astronomical research sites are: the Royal Greenwich Observatory; the Royal Observatory, Edinburgh; Cambridge University; the University of Manchester; and University College, London. Starlink provides a powerful interactive image processing and display system for all sites. Floating Point System AP-120B's are attached to VAX 11/780 for signal processing computations. Each system is equipped with an Advanced Raster Graphics System (ARGS) manufactured by Sigma Electronics Ltd. The ARGS displays color images with 512 x 512 pixels. It provides the capability of picture switching, feature highlighting, zooming, and other graphics functions.

The Starlink computers are running the VAX VMS (Virtual Maching System) operating system. Through an interactive graphics package (FINGS) developed in conjunction with ICF, astronomers at each of the five research sites can conveniently transfer files, local utility programs, and spectral analysis packages for initial applications to allow the orderly and coordinated development of general purpose Starlink-specific software. The installation of Starlink was completed in 1981. At present, there are 90 astronomical research projects in the UK using Starlink.

(2) Stella

In western Europe, approximately 2,000 high-energy physicists are working in 150 different centers. Cooperative experiments are normally conducted among several universities across national boundaries. Heavy computation requirements and rapid data transmissions are essential for their cooperative efforts. At the suggestion of the European Space Agency, an experimental high-speed transmission link has been established via orbital test satellite (OTS) from CERN (Conseil European pour La Recherche Nucleaire, Geneva) to four other major high-energy physics research centers, namely, IFNF (Istituto Nazionale di Fisica Nucleare, Pisa), DESY (Deutsches Elektronen-Synchrotron, Hamburg), The Saclay Nuclear Research Centre (Paris), and RAL, so that users can send their magnetic tapes via this 1-megabit link. The current bit error rate of the link is 1 in 10^6, which still needs improvement.

The GEC 4080 system at RAL is the Stella interface processor. An Ethernet connection has been developed at RAL between the GEC 4080 and the virtual machine in IBM 3032 and IBM 360/195s, which are dedicated to high energy physics computations. Through the SRCnet the gateways to other systems in the UK are thus provided.

Summary Comments

Through RAL network projects, SERC and the UK government are effectively managing computer resources in the university research community. The subtle objective of the approach is to gain visibility and to eliminate duplication of research efforts by managing information. A network of computers has become an efficient tool to distribute processing resources and to promote collaborative research projects in the community. RAL, as a government establishment, has fulfilled its mission remarkably well in conducting in-house R&D that has a profound impact on the education and R&D of the entire country.

Y.S. Wu

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THE ORBEL 1 MEETING

The First National (Belgian) Congress on Quantitative Methods for Decision Making (ORBEL 1) was held on 9-10 December, 1981. The congress was organized by SOGESCI-BVWB. SOGESCI stands for Société Belge pour L'Application Des Méthodes Scientifiques De Gestion, and BVWB signifies Belgische Vereniging voor De Toepassing Van Wetenschappleijke Methoden in Het Bedrijfsbeheer. These are the French and Flemish elements of the Operations Research Society of Belgium. The language of the meeting was (as noted by the society president)

"The dominant scientific language in the world...broken English." The meetings were held at the Free University of Brussels and then switched to the IBM Education Center in Brussels on the afternoon of the second day. There were approximately 215 registered participants. In addition to the presentations by 6 plenary session speakers, approximately 50 papers were presented in 3 concurrent sessions. The sessions covered 15 separate topical areas.

As with any meeting of this type, there was a wide range of content and quality in the presentations. In addition, it was possible to hear only one-third of the papers given in the parallel sessions, but there were interesting highlights. Egon Balas (Carnegie-Mellon Univ.) gave a plenary address on "Recent Results on Covering Problems." Covering problems are a special form of mathematical programming problems that have wide application in facility location, activity scheduling, production distribution, marketing, and finance. Balas discussed several recent theoretical developments and their impact on the ability to solve large covering problems.

In the last plenary address, N. Kenneth Boudwin (ESSO Europe, Inc., London) discussed "PLATOFORM, Exxon's Generalized Approach to Mathematical Programming Support Systems." Basically, PLATOFORM is a high-level programming language that allows company analysts to develop and implement mathematical programming applications in record time (2 to 4 weeks). With this short development time, problems can be solved while they are still problems, and development costs are a relatively minor factor in cost-justifying projects. An important side benefit is that systems maintenance work for ongoing applications is brought to nearly zero. It might be noted that this sort of system, with its quick-response-time potential, might have some important uses in the "short fuse" environment of military logistics planning.

The following are highlights (in no particular order) from the parallel sessions. René Fourneau (Université de Liége, 4000 Liége, Belgium) presented "An Improvement of Khachian's Method." Khachian's method is a geometric approach to linear programming that caused a stir in scientific circles a few years ago but subsequently has been shown to be inferior to the traditional "simplex method." Fourneau has modified Khachian's method and claims improvements of 20 to 1 in computation time.

Geert Callens (GTE ATEA, 2410 Herentals, Belgium) discussed "A Simple Extension to the PERT-Planning Technique." Callen's extension is a modification of the traditional "Bar Chart" output of CPM-PERT (Program Evaluation and Review Technique) systems. His approach retains elements of the CPM network in the output in that a plotter is used. The result is that the user is capable of "seeing" the effect of slipped project elements much more clearly and is able to effect changes in the schedule by hand that normally would require additional computer runs.

A. VanRoy (Center for Operations Research and Econometrics, 1348 Louvain-La-Nouve, Belgium) presented "Using Computer Models for Distribution Planning." VanRoy developed an extension for mixed-integer mathematical programming models called "Cross-decomposition." His method facilitates the solution of large-scale problems of the distribution planning type. He reported a case history of a large milk-products distribution company in Great Britian where he solved problems with up to 29,000 variables.

People interested in statistical clustering were well served at ORBEL 1. Six papers were presented in two sessions. Titles included "A New Algorithm For Optimal Determination of Clusters" by J. Akoka (Ecole Superieure des Sciences Economiques et Commerciales, 95021 Cergy, France), "New Developments in Validating Clustering Results" by E. Backer (Delft Univ. of Technology, 2600 Delft, The Netherlands), and other closely allied topics.

G. VanVelthoven (Ecole Royale Militaire, 1040 Brussels, Belgium) spoke about "System Dynamics Analysis Investigating Disarmament Scenarios in Conventional Warfare Opposing Warsaw and NATO Blocks." VanVelthoven modeled the use of systems of differential equations (i.e., DYNAMO Computer Language) that are used to describe the complex interactions of conventional warfare. The model included the effects of ground forces, logistics requirements, air close support and interdiction, etc. His experimental work (not yet completed) consists of playing out different scenarios of disarmament to determine the possible outcomes of World War III. Preliminary results indicated that all the disarmament scenarios tested so far would result in speeding the conclusion of the war to the advantage of the Warsaw block. This apparently came as a surprise to some of the audience, and a spirited discussion followed.

Finally, Thom J. Hodgson (Univ. of Florida, Gainesville, and Katholieke Universiteit Leuven, 3000 Leuven, Belgium) presented "An Interactive Pallet Loading System." Hodgson developed a constructive algorithm using dynamic programming to determine the location of boxes on a pallet.

The algorithm maintains control over the center of gravity of the pallet and includes the ability to place specific "volatile" boxes on the periphery of the pallet (a requirement for certain military applications). The system is interactive in the sense that the user is able to manipulate sets of boxes prior to pallet loading and thereby play a significant role in controlling the actual loading. The system was programmed in FORTRAN IV on a PDP11/34 computer.

The conference was concluded with a reception at the IBM Education Center. This was a welcome method of maintaining attendance of a large number of participants right up to the end.

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EARTH SCIENCES

METEOROLOGY STUDIES IN ITALY AND FRANCE

The University of Bologna

At the University of Bologna there is a small, highly productive group of scientists working on important problems in theoretical meteorology, particularly the interaction of the large-scale atmospheric circulation with mountains. The group, which is in the Istituto di Fisica A Righi, is headed by Dr. Antonio Speranza, who has a background in astrophysics, geophysical fluid dynamics, oceanography, and meteorology. Other prominent theoreticians include Dr. Anna Trevisan and Dr. Andrea Buzzi. Speranza, Trevisan, and Buzzi are doing extensive research on the problems of quasiresonant orographic forcing, multiple equilibria, blocking, and baroclinic instability in the presence of mountains. Another young scientist, Sandro Rambaldi, is also participating in this effort. The original motivation for the work was to improve prediction of cyclogenesis in the lee of the Alps, where storms often form in the Gulf of Genoa and sometimes force oscillations in the Adriatic basin, with consequent flooding of Venice. Much of the research, however, has taken on a fundamental character and is being published in high quality scientific periodicals such as the *Journal of Atmospheric Sciences* and the *Journal of Geophysical and Astrophysical Fluid Dynamics*.

The theory of multiple equilibria predicts that there are at least two stable equilibrium solutions to the nonlinear equations governing large-scale atmospheric motions in the presence of mountains. One is characterized by highly zonal flow such as that which meteorologists call "high index." The other is marked by weak zonal flow and strong waves with blocking characteristics such as that which meteorologists call "low index." As the atmosphere evolves in a nonlinear fashion, it can come sufficiently close to one or the other equilibrium state to become locked into that state for considerable periods of time. This was proposed by the late J.G. Charney (Massachusetts Inst. of Technology) and others as a possible explanation for high and low index phenomena and possibly for blocking. The group at Bologna is now looking into the stability of these equilibrium states in the presence of small barotropic and baroclinic wave perturbations. If either of the otherwise stable equilibrium states is barotropically or baroclinically unstable, further changes can be expected to develop and lead to still different global wind configurations.

Another important scientific problem being pursued at Bologna is that of the interaction between synoptic-scale waves and the mean zonal flow—in particular a study by Giovanna Salustri on the forcing of the Ferrel cell. Salustri has calculated the strength and position of the Ferrel cell forced by eddy fluxes of heat and momentum. The Ferrel cell contributes to the maintenance of deserts at 30° latitude and the persistence of low pressure centers (e.g., the Aleutian and Icelandic lows) around 60° latitude.

The Bologna group has successfully interacted with scientists at MIT, Imperial College, London, and the University of Oslo. Speranza, Salustri, and Rambaldi have been frequent visitors to MIT and, until his death, Charney visited Bologna quite frequently. Buzzi has spent considerable time at Imperial College working with Prof. John Green, who recently has been supervising the PhD dissertation (on blocking) of L. Illari from Bologna. Prof. Arnt Eliassen (Univ. of Oslo) has also visited Bologna for an extended period.

CNRS, Paris

The Centre National de la Recherche Scientifique (CNRS) has two facilities in the greater Paris area at which research is under way in dynamic meteorology. One is the Laboratoire de Météorologie Dynamique (LMD) at Rue Lhomond in Paris. The other is the Service D'Aeronomie at Verrieres-le-Buisson near Paris. Interesting work is being done by Dr. Hector Teitelbaum at the latter facility on the vertical flux of zonal momentum in the thermosphere

resulting from the propagation of atmospheric tides. Teitelbaum finds that the flux convergence of momentum contributes to the acceleration of the thermosphere and the maintenance of high altitude mean zonal wind against dissipative processes. He has observed that the first propagating mode induces an eastward acceleration at 100 km altitude poleward of 20° latitude and a westward acceleration equatorward of 20° latitude. This theoretical result is in agreement with available atmospheric observations.

At the LMD there is a vigorous effort, under the direction of Robert Sadourny, in numerical weather and climate prediction, geostrophic turbulence theory, and the theory of predictability. One important result of the recent research of Sadourny and his colleagues, C. Basdevant, B. Legras, and M. Béland, was the finding that the spectral slopes corresponding to the enstrophy cascading inertial range in turbulent barotropic nondivergent flows are significantly steeper than the k^{-3} slope predicted by the Kraichnan theory of two-dimensional turbulence. The reason for this result lies in the space and time intermittency of such turbulence, which was not considered in the Kraichnan theory. The LMD group also found that such intermittency, associated with steeper spectral slopes, restores locality of the nonlinear transfers in wave-number space, in contrast with the nonlocality of two-dimensional nonintermittent turbulent flows. Moreover, they found that the presence of Rossby waves increases predictability through (1) direct inhibition of nonlinear transfers in the larger scales of motion, (2) concentration of energy in more highly predictable large-scale zonal structures, and (3) slowdown of error propagation in the enstrophy inertial range due to the presence of anisotropy at small and intermediate scales.

The theoretical result of spectral slopes steeper than k^{-3} is particularly interesting, as we find in the laboratory experiments we have been conducting a predominance of k^{-4} slopes in the dimensionless parameter space characterized by geostrophic turbulence. We intend to examine our laboratory data to determine the extent to which the characteristics of our observed geostrophic turbulence resemble those in the theory.

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MATERIAL SCIENCES

CONFERENCE ON ELECTROCHEMICAL METHODS IN CORROSION TESTING AND RESEARCH

Corrosion scientists and technologists have long relied on electrochemical methods in mechanistic research and in attempts to predict the corrosion rate of a material or its propensity to corrode. Meetings such as the one on "Electrochemical Methods in Corrosion Testing and Research" that was held on 4-6 January 1982 at the University of Manchester Institute of Science and Technology (UMIST) provide workers in the corrosion field a means for reviewing recent developments and applications of these all-important electrochemical methods.

The subjects of most of the 25 presentations at the meeting could be categorized as follows: (1) improved electrochemical hardware and equipment for gathering and analyzing data; (2) the application of ac impedance techniques in corrosion studies; (3) new, improved, or novel uses of electrochemical methods; (4) results of recent mechanistic studies using electrochemical techniques.

In the first category, both C.D.S. Tuck (Alcan International Ltd., Banbury, UK) and R.A. Cottis (UMIST) gave presentations on the development and use of microelectrodes for corrosion research. Tuck, whose interest is in obtaining electrodes small enough to identify local anodic and cathodic sites on aluminum alloys, talked about his work with silver-silver chloride, tin-tin oxide, and calomel microelectrodes. His electrodes were made by drawing down glass capillaries. For silver-silver chloride, a 5-μm diameter tip could be produced, but it tended to be noisy due to air bubbles. The tin-tin oxide electrode could be produced with a 1-μm diameter tip that usually was inserted within another capillary to improve handling. Although the electrode polarized somewhat, it could be used satisfactorily. The calomel electrode, which could only be produced with tips of about 0.5-mm diameter, could be used dry. Tuck illustrated the use of the electrodes for detecting anodic areas of welds of 7000 series alloys made with Al-Mg and Al-Cu weld metals, anodic areas of rivets due to preferential precipitation that occurred in the cold worked rivet head during service, and the anode-cathode relationship of secondary phases with their matrix alloys.

Cottis is interested in microelectrodes for determining the chemistry at the tips of growing stress corrosion or corrosion fatigue cracks. To accomplish this, Cottis precracks a specimen and seals the microelectrodes into a small hole drilled from the back of the specimen toward the crack. Then he conducts his stress corrosion or corrosion fatigue test. The microelectrodes are activated and the crack tip chemistry is determined when the growing crack front intercepts the drilled hole containing the microelectrodes. Currently, he is looking at three microelectrodes, silver-silver chloride for measuring chloride ion concentration, oxygen diffusion probes, and pH probes based on the Pt-quinhydrone system. Only the last named was far enough into development for discussion, and he described two versions. The first consists of a Pt wire within an insulating covering with the exposed end face covered by a permeable film containing quinhydrone. Although the electrode is fairly insensitive to pH changes after long immersion in solution, it provides very rapid measurement of pH upon initial immersion, which is compatible with Cottis' test mode. Another version consists of a Pt wire coated with quinhydrone surrounded by a concentric agar-KCl salt bridge in a polyethylene catheter. This gives fairly rapid response within 5 sec of wetting and is accurate to ± 0.1 pH unit. Cottis felt that electrodes based on this system offered advantages over the glass or antimony-antimony oxide electrode despite their limitation to pH values below 8 and the possibility of errors due to salt contamination.

N.D. Greene (Univ. of Connecticut) described the development of a numerical method of calculating corrosion rates using polarization data and an inexpensive minicomputer. The computer program is an iterative technique using a method of residuals.

J.C. Rowlands (Admiralty Marine Technology Establishment, Holton Heath, UK) discussed the development of ac impedance equipment for predicting the performance of paints. The equipment developed applies a 10-mV peak-to-peak sine wave across the corrosion cell over the frequency range 10 kHz to 5 Hz and measures the current produced with its corresponding phase angle. In tests on steels coated with a chromate primer (25 μm thick), a pigmented phenolic resin paint (50 to 40 μm thick), and a coal tar epoxy paint (20 to 40 μm thick, applied hot and 200 to 300 μm thick, applied at room temperature), Rowlands showed that the equipment could follow the uptake of moisture by the films and the general degradation of the films with time. He also discussed some preliminary work on modifications of the equipment to produce an isolated electrode in a waterproofed polyurethane foam cell that could be used to evaluate the integrity of paints on immersed structures in the field.

The application of ac impedance techniques in corrosion studies was the subject of several papers at the conference. L.M. Callow (UMIST) and M.W. Kendig (Rockwell International, Thousand Oaks, CA) talked about the use of impedance techniques to evaluate the performance of coated metal systems in corrosive environments. Callow, investigating unpigmented 50-μm-thick vinyl coatings on steel in seawater, pointed out some of the advantages and disadvantages of the technique. In particular, he mentioned the difficulty of measuring the rest potential of a coated system and pointed out the dependence of the corrosion rates measured with this technique on polarization procedure. But he also showed that the technique was quite capable of determining film breakdown. Kendig discussed the behavior of polybutadiene coatings on a number of substrates: steels pretreated in various ways before coating in order to study the effect of pretreatment on corrosion resistance; phosphated steel; and 2024, 6061, and 7075 aluminum alloys pretreated by simple degreasing, hydroxide etching, or conversion coating. By studying the behavior of the impedance spectra of these materials in 0.5 M sodium chloride over the range 1 MHz to 20 mHz for periods greater than 200 hours and correlating this with visual observations, Kendig showed that coating breakdown was caused by penetration of the film by the electrolyte in pores that were both perpendicular and parallel to the coating-metal interface. Furthermore, he showed that the impedance technique could be used as a basis for ranking the pretreatments.

D.D. MacDonald (Ohio State Univ.) presented the results of an impedance study of the growth of porous magnetite films on iron in high-temperature aqueous environments. The research is particularly relevant to the tube denting problems experienced in steam generators of pressurized water reactors, which have been attributed to the expansive growth of magnetite in crevices between heat exchanger tubes and support plates. MacDonald presented growth-rate data taken at 250°C and showed that a finite transmission-line-equivalent circuit could generate the same impedance spectra as actually measured and could be used to study the growth mechanism and the kinetics of growth.

B. Elsener (Swiss Federal Institute of Technology, Zurich) presented the results of electrochemical studies of active-passive transitions in 304 stainless steel in ethanolic-HCl solutions both with and without water. For his research he used both ac impedance and interrupted dc techniques to determine IR drops. The interrupted dc technique consisted of inserting a high resistance electronically between the potentiostat and the working electrode and measuring the potential decay. Interruption accounted for about 10% of total experimental time and had a time period of about 1 msec. The potential information was used in a computerized program along with separately determined Tafel slope values for determining and correcting for IR drops. Comparison with ac impedance measurements showed good correlation of the IR values with values obtained from intercepts of the high frequency branch of the complex plane impedance plots with the real axis. In addition, impedance measurements showed that two reactions occurred upon addition of water to the solution and that passivation effects could be seen long before the maximum current was experienced.

J. Dawson (UMIST) reported on a sophisticated variation of the usual impedance technique, harmonic analysis, in which the first three harmonic components of the current caused by the perturbing ac voltage signal are analyzed to determine the corrosion current and Tafel slopes. In Dawson's example, analysis was either by Fourier series expansion or by a less exacting Taylor series expansion in which terms higher than the fourth power were neglected. Corrosion rates of mild steel as a function of time in 0.25M H_2SO_4, determined by harmonic analysis, ac impedance techniques, and weight loss measurement gave comparable results, although harmonic analysis appeared more accurate at short exposure times. Dawson observed that the technique was probably too sophisticated to be used on field problems. An additional problem is that the small perturbing signal that must be used results in harmonics that are of the order of instrumental noise, and accurate measurement is difficult.

Analysis of electrochemical noise to study corrosion reactions was among the more novel electrochemical techniques reviewed at the conference. U. Bertocci (National Bureau of Standards, Washington, DC) and K. Hladky (UMIST) talked about their investigations using analysis of random electrode potential fluctuations (electrochemical noise) to obtain information about corrosion processes, especially localized corrosion such as crevice attack, pitting, cavitation, etc. Hladky in particular showed that the noise spectra, determined with a digital voltmeter, could be analyzed using FFT (Fast Fourier Transform) and MESA (Maximum Entropy Spectral Analysis) techniques to obtain standard deviations in the noise signals that were determined to be proportional to corrosion rates. Hladky illustrated the technique by showing how it had been used to monitor corrosion at start-up in a chemical plant, cavitation corrosion in a pipeline, and selective attack in a bronze alloy. The conclusions were that the method gave a measure of the corrosion rate, the amplitude of the noise was indicative of the electrode area involved in the corrosion reaction, and the shape of the signal could be related to the type of corrosion process involved. In a follow-up presentation, P.C. Searson (UMIST) described the results of laboratory and on-site use of noise and ac impedance measurements to monitor the corrosion rate of steel reinforcing rods in concrete. He showed that the techniques were capable of providing information on corrosion of the rods both during concrete curing and after curing. For on-site measurements, he showed correlation between high corrosion rates and the appearance of rust spots on the surface of several reinforced concrete structures. Searson felt that noise measurement could be a valuable new tool for assessing on-site corrosion problems and said that it was, of course, a much simpler technique to use in a practical field situation.

M. Keddam, (CNRS, Paris) described a novel electrochemical-abrasion technique to study the depassivation of iron in 1M H_2SO_4. In his work he abraded the passive layer from the iron surface by bombarding with a suspension of SiC (30 to 50 impacts/cm^2/s) in electrolyte. The rotating specimen was instrumented for electrochemical ac impedance measurements and immersed in electrolyte during abrasion. Keddam compared the surface produced by this method with that produced on a straining electrode ($\dot{\varepsilon} < 10^{-2}\ s^{-1}$). He concluded that the two techniques resulted in significantly dissimilar surfaces. In the case of straining electrodes at passive potentials, his impedance data indicated that, rather than rupturing, the passive film thinned. The abrasion technique, however, resulted in complete destruction and removal of the passive film. At potentials near the corrosion potential, straining appeared to produce more active sites and resulted in an increase in the anodic current. Little increase in anodic current was produced under these conditions by abrasion, but

the cathodic reaction was increased. Keddam's general conclusion was that abrasion was more suitable than straining to produce fresh metal surfaces for corrosion studies.

P. Aaltonen, (Technical Research Center, Finland) compared various electrochemical techniques for assessing the intergranular corrosion suceptibility of austenitic stainless steels. These included anodic polarization and constant potential etching in 1N $HClO_4$ + 0.2N NaCl and a recently developed potentiokinetic reactivation test (EPR). Sensitization is revealed in the EPR test by the size of the activation peak as the metal is scanned at a rate of 6V/h from the passive to active region in deaerated 1N H_2SO_4 + 0.01M NH_4SCN. Prior to the scan the metal is passivated for 2 min at 200 mV_{SCE}. Aaltonen showed by comparison with SEM photographs that the tests were reasonably selective in attacking the Cr-depleted grain boundaries and revealing sensitization, and he observed that they compared favorably with Strauss test results. It was pointed out, however, that under certain circumstances carbide attack that would interfere with test interpretation was also observed. Other limitations were also noted. For example, while attack begins at the Cr-depleted grain boundary in the EPR test, propagation is into the grain whereas the constant potential does not suffer from this problem. Overall, however, the limitations must be compared with the advantages, especially their applicability to testing in the field.

Presentations on the recent mechanistic studies varied over a range of subjects. H. Horowitz (Exxon Research and Engineering, NJ) and R.C. Newman (Brookhaven National Laboratory, NY) presented findings of investigations of the stress corrosion (SCC) of sensitized stainless steels by polythionic acid and thiosulfates. Horowitz concluded that SCC was a case of accelerated dissolution. He proposed a mechanism by which tetrathionates and thiosulfate, formed by the reaction of FeS with oxygen, act as catalysts for iron dissolution reactions. Newman, on the other hand, judging from scratching electrode tests and using electrochemical testing of simulated, depleted-grain-boundary alloys in thiosulfate solutions, concluded that the SCC velocities were too high to be explained fully by an electrochemical mechanism.

M. Kendig, Rockwell International (Thousand Oaks, CA) reported on an ac impedance study of the corrosion of iron in tap water and ASTM corrosive water with and without perchlorate and nitrite additions. The effect of these additions on the passivation behavior of iron was discussed.

W.H.D. Turner presented a study of the determination of anodic and cathodic areas in steel welds and the effect of cathodic protection. To do this he sliced the welds into sections, inserted insulators between the sections, and rejoined them. He then determined the galvanic interactions between sections in a corrosive environment with zero resistance ammeters.

V. Agarwala (Naval Air Development Center, Warminster, PA) talked about his research on the synergistic effect of corrosion on wear processes. He especially pointed out the importance of corrosion to total material losses in wearing systems wherein passivation could occur, and the use of corrosion inhibitors to reduce wear damage.

R.P. Wei, (Lehigh Univ., Bethlehem, PA) and T. Hodgkiess (Univ. of Glasgow) presented results of research on corrosion fatigue of steels. Wei, speaking about research on HY130 steels, reported on the role of environmental interactions on fatigue crack growth rates and the necessity of determining electrochemical reactions with fresh metal surfaces in order to understand crack growth mechanisms more fully. He outlined his model for environmental fatigue cracking of HY130, which involves hydrogen generation by reaction of the fresh metal surface with the environment followed by hydrogen uptake to degrade the region in front of the crack tip. Hodgkiess presented initial findings of his study of potential and pH changes in growing fatigue cracks of steel in seawater. He used microelectrodes (calomel and glass) inserted in holes drilled to intercept growing cracks, similar to the method reported by R. Cottis at the conference. With a loading frequency of 0.1 Hz and freely corroding conditions, Hodgkiess showed that the crack pH dropped to about 4.5 after 4 to 5 days' exposure and the crack potential moved in the active direction. The research was still in progress and no conclusions about these changes were drawn.

J.W. Oldfield (INCO, Birmingham, UK) described mathematical modeling of the initiation and propagation of crevice corrosion of stainless steels in salt water, but only the initiation stage had been modeled at the time of his presentation. The model consists of an actively corroding anode within the crevice and cathodic reactions of either hydrogen reduction within the crevice or oxygen reduction outside the crevice. Time to deplete oxygen in the crevice, and pH decreases with time due to Cr hydrolysis, gap size,

etc., are taken into account by the model. Oldfield maintained that despite the fact that only preliminary modeling had been possible, it had already proved useful in practice. Eventually, it is hoped, the model will allow better selection of materials for use in circumstances where crevice corrosion problems could arise and provide the capability to define more acceptable environments and geometries to lessen the chance for this type of degradation.

R.L. Martin (Petrolite Corp., St. Louis, MO) outlined how standard electrochemical techniques were used successfully in both the laboratory and the field to monitor corrosion and evaluate inhibitors, etc., in the oil industry. On this very "upbeat" paper the conference ended.

The conference, modest in terms of the number of papers given, provided a good picture of the present state of electrochemical methods for analyzing corrosion related phenomena. Although publication of the proceedings of the conference is not planned, many of the papers will be submitted to *Corrosion Science* for possible publication.

Philip A. Clark

ONR London

NEWS AND NOTES

A MEETING OF THE CHALLENGER SOCIETY

The Challenger Society is probably the world's oldest scholarly association concerned with oceanography and its promotion. Formed in 1903, the society now has over 400 members and meets regularly for scholarly presentations. Dr. R. I. Currie of the Scottish Marine Biological Association, Dunstaffnage Marine Research Laboratory, P. O. Box 3, Oban, Argyll PA34 4AD, Scotland, is the honorary secretary.

The society is recipient of a grant from the Natural Environment Research Council (NERC) to provide traveling and subsistence expenses for researchers attending meetings convened by the society. The grants are particularly intended for younger scientists and graduate research students. Generally not more than five grants are awarded for any one meeting.

The 282nd Scientific Meeting was held on Wednesday, 16 December, in the Scientific Societies Lecture Theatre, Savile Row, London. The 1-day session was on "Problems of North-East Atlantic Circulation." The program comprised the chairman's introductory remarks, eight scheduled papers, and one brief nonscheduled talk on eddies by Dr. R. T. Pollard, Institute of Oceanographic Sciences, Wormley. The scheduled speakers and topics of discussion were as follows:

(1) Prof. J. D. Woods (Institut für Meereskunde, Kiel): The Kiel 'Warm water sphere' programme - preliminary results of the 1981 Summer expedition.
(2) Dr. W. J. Gould (Institute of Oceanographic Sciences, Wormley): Eddy formation south of the Azores.
(3) Dr. R. R. Dickson (Ministry of Agriculture, Food and Fisheries, Lowestoft): Eddy climatology of the North Atlantic.
(4) Dr. J. G. Harvey (School of Environmental Sciences, University of East Anglia): Water-masses in a mesoscale eddy in the eastern North Atlantic (Tourbillion expériment).
(5) Dr. P. M. Saunders (Institute of Oceanographic Sciences, Wormley): An interpretation of northeast Atlantic circulation south of 50°N.
(6) Dr. D. A. Booth (Scottish Marine Biological Association, Oban): Observations of the slope current west of Scotland.
(7) Dr. J. Huthnance (Institute of Oceanographic Sciences, Bidston): Whence the slope current?
(8) Mr. J. H. A. Martin (Department of Agriculture and Fisheries for Scotland, Marine Laboratory, Aberdeen): Water-mass analysis and long-term changes in the Faroe-Shetland region.

All the speakers except Woods were from UK institutions, and Woods was formerly at the University of Southampton. Woods' paper was based largely on data collected using an undulating sampling device that operated through the upper 80 meters (Woods used the term "bat fish" in a generic sense to apply to a device made at Kiel. However, Batfish is a trade name, and oceanographers should probably come up with a nonregistered term.)

The three papers on mesoscale eddies presented widely different aspects. Gould described a program of observations of meanders and eddy formation south of the Azores that included CTD and XBT hydrographic observations and the tracking of drogues deployed at several depths.

The formation of one eddy was documented and its change with time as it moved southwestward was described. Dickson's paper was concerned with the climatology of North Atlantic eddies, evaluated from historical data and analysis of the ratio of eddy kinetic energy to local mean kinetic energy.

Saunders' paper was a broadbrush evaluation of mass transport of waters in the northeast Atlantic south of 50°N. Transport through five sections as estimated from the Leetma-Bunker wind stress calculations, transports calculated from the Sverdrup relation, and continuity considerations were used to give balances of average transport, generally northward and generally southward, through the sections.

The papers by Booth, Huthnance, and Martin were more concerned with continental shelf processes. Booth's paper was largely descriptive of a northward flowing current along the west of Scotland. The current appears to be a permanent feature and is being called the "Shelf Current" by the Oban group. Huthnance's paper was a theoretical consideration of models for the formation of the slope current. Martin was the only speaker to invoke chemical observations to assist in the interpretation of the physical oceanography (water mass analysis and long-term changes) in the Faroe-Shetland region.

The Challenger Society, or at least the convener of this meeting, D. J. Ellett of the Scottish Marine Biological Association, had hit upon a program that was not too long, not too short, had a central theme important in contemporary oceanography, and varied in its approach from large-scale observations with modern methodology to theoretical mathematical modeling.

There was time for good discussion, which was continued in small groups that gathered for dinner.

Distances are too large for such a society to work so successfully in the US, but in the UK it seems to be enormously successful. The high productivity of UK oceanographers may well reflect in part the activities of the Challenger Society.

Francis A. Richards

ONR London

THE NATO SCIENCE COMMITTEE LAUNCHES ITS "DOUBLE JUMP" PROGRAM

Over the past 20 years, the NATO Science Committee (NSC) has developed several programs aimed at fostering international cooperation and collaboration in research and development. The programs, however, have been restricted to academic researchers and research activities. Recognizing that scientific research today is more expensive and complex than ever and therefore must encompass government and industrial insitutions in an integrated effort, the NSC has launched a new program that it calls Double Jump.

The name Double Jump refers to the two prerequisites a collaborative effort must meet to qualify for support:

(1) It must be a program between institutions of two NATO countries.
(2) It must be a program between a university in one country, and either an industrial or governmental institution in the other.

Although some details remain to be worked out, Double Jump will probably be implemented along the following lines:

(1) Science fellowships that enable established research work abroad for 3 to 12 months. Grants of up to $15,000 are envisioned, and it is assumed that the researcher's parent institution continues to pay his normal salary.
(2) Advanced study institutes that are tutorial meetings, about two weeks in duration, which are highly technical and extremely specialized. Grants of about $30,000 are envisioned. The audience would be small and at approximately the postdoctoral level.
(3) Advanced Research Workshops, which are shorter (5-day) working meetings in which researchers attempt to review the state of the art in specific fast-moving fields. The workshop is not tutorial in nature.
(4) Cooperative Research Grants, which promote prolonged collaboration between two research institutions. Initially awarded for a period of 1 year, they can be extended, 1 year at a time, up to a total of 4 years. The grants average $5,000 per year to meet travel and living expenses.

Double Jump offers unique financial assistance to researchers and research institutions interested in international

collaboration with NATO nations. Although the grants are not large, they can help defray some of the costs of technical exchange endeavors. Requests for information and application details should be directed to Dr. M. Di Lullo, Scientific Affairs Division, NATO International Staff, 1110 Brussels, Belgium.

CDR Joseph A. Strada

ONR London

UK NATIONAL OCEANOGRAPHIC DATA CENTER

The Marine Information and Advisory Service (MIAS) has the responsibility within the UK for achieving good quality oceanographic information and data so that it will be readily accessible to potential users. The data bank is concerned primarily with measurements from waters around the British Isles or those made by UK organizations elsewhere. Initial priority has been given to instrumental wave and current measurements for the UK continental shelf and deeper waters.

MIAS holds wave data for more than 30 sites around the British Isles, and it also holds 80% of some 2,700 measurements collected from moored current meters from 1967 to 1979. Recently, MIAS has begun to add to the bank a considerable collection of sea-level data as well as nearly 20 years of sea-surface temperature data (with some salinity data) for both coastal stations and shipping routes. MIAS also acts as a center for environmental data collected on behalf of the UK Offshore Operators' Association (UKOOA); however, these data (except meteorological observations) are confidential to the Oceanographic Committee of UKOOA for 5 years from the date of reporting.

The UKOOA measurement sites include three weather ships, two oil platforms, and two data buoys. Most of the banked data are available in numerical time series formats, but the data can be obtained in various graphical presentations also. Further information may be obtained from the MIAS Enquiry Office, Institute of Oceanographic Sciences, Wormley, Surrey, England.

LCDR R.W. Booker

ONR London

PERSONNEL COSTS IN MERCHANT SHIPPING

In a previous issue (*ESN* 35-11:410 [1981]), the remarkable staffing changes in merchant shipping were noted. For example, there are unmistakable worldwide trends toward Liberian registration and all-Asian crews. A recent analysis, by David Moreby of Plymouth Polytechnic (UK), gives some figures that delineate the financial aspects of the problem.

In 1970, Polytechnic's Maritime Studies faculty tabulated the wages paid to seafarers from six different countries, and the cost to the owner of each seafarer. Here is part of that tabulation.

Country	Average Annual Cost (US$) of Owner for 1 Seafarer	Annual Wage of A.B. Seaman	Multiplier
UK	6,200	1,320	4.7
Norway	8,400	1,920	4.4
Japan	6,600	1,400	4.7
Australia	13,400	2,180	6.1
India	1,800	320	5.6
USA	21,400	4,320	4.9

The tabulation suggests a rule of thumb: the total crew cost of a vessel is about equal to the number of crew x 5 x the basic able-bodied seaman's wage.

Eleven years later, wages have increased by several times (net US A.B. seaman pay is now more than $13,000), although the multiplier is still about five for the UK, Norway, and US. But there is a different picture for ships staffed from Taiwan, Hong Kong, and the Philippines, where the multipler varies from 3.8 down to 2.3. In the latter countries, wages have risen much less, relative to the total per-person cost to the owner.

The financial implications of these costs are quite drastic. Moreby has worked out the numbers for a typical real ship. For the illustration, he takes a new Panamex bulk carrier, London-owned and operating under the UK flag. The vessel cost 26 million dollars to build under a 12% OECD loan; it hauls a cargo deadweight of 57,000 tons, requires 11 officers and 22 ratings, makes 8,000-mile round trips, has 6 days port time per round trip, and so forth. With a Norwegian crew, the annual fixed costs of operating the ship amount to $5,315,000, of which 27% is crew cost. With a Philippine crew, the fixed cost is $4,272,000, a paper saving of over a million dollars per year.

One might argue that Norwegian seafarers are better trained or otherwise more productive than the Philippine crewmen and that this efficiency differential would allow the owner to get along with a smaller crew, if only Norwegians were hired. How much smaller would the crew have to be? The answer is, enough to save a million dollars a year. One possible "savings" plan is as follows:

Maintenance/Repair	$380,000 >	$180,000 =	Save $200,000
Store, Etc.	220,000 >	180,000 =	" 40,000
Insurance	310,000 >	280,000 =	" 30,000
			Save $270,000
Increase in Effective days at sea	350 <	360	Earn $251,000
Save 2 tons/bunkers/days at sea			Save 103,680
		Max Savings	$624,680
		Need to Save	1,043,000
		Short Fall	$418,320

As the numbers work out, the Norwegian crew would have to be reduced by 15.7 or 16 men to achieve the desired savings. One can hardly contemplate such a drastic reduction, even if there were some demonstrable crew differences between nations (no substantial evidence of such efficiency differences seems to be available).

As Moreby well knows, calculations like these are always subject to minor criticisms. But the overwhelming conclusion is that a western shipowner who wants a western crew would have to pay dearly for that policy. It seems a certainty that, without western governmental laws and subsidies, the decline of western shipping would be far more drastic than it already is. At the time of the ERGOSEA Conference in October 1981 (*ESN* 35-11:410 [1981]), one British company was "flagging out"—selling its ships to a Hong Kong operator. The company survived, but all the UK seafarers were immediately discharged and replaced by Asian crewmen.

Moreby makes a further point about the ratio of number of crewmen to number of officers, as total crew is reduced. With a 36-man total crew, there will be about 2.5 ratings per officer, but when the total man count goes down to 20 or less, then there is about one rating per officer. This trend may eventuate in a more egalitarian shipboard structure.

At the same time these personnel issues are being felt in the industry, there are other things happening. Ships are more mechanized and more specialized; indeed, some are specially engineered for carrying only one product, some are designed to traverse only one route across the oceans. A stock response from some engineers is that automation and robotization is the west's best possibility for managing these problems and for saving the industry. Certainly recent palleting and cargo handling methods have improved efficiency, often by orders of magnitude. But automation to levels below a dozen men for major capital ships seems unlikely for some decades. At the political level in western countries, a more likely "solution" will be further subsidy programs to embrace personnel and other shipowner cost differentials.

Nicholas A. Bond, Jr.

ONR London

NEW DOT IMAGE PRINTER

Printed pictures are made out of dots. When photographic processes are used, the dots vary in size to yield a toned image. Virtually all computer-driven systems, however, produce only fixed-sized dots, and locations in the image matrix are either printed or not with the standard dot.

At Cambridge Consultants (UK), Stephen Temple and Ian Phillips have devised a method for recording an image by clustering very small dots, and converting these into a digital code. The stored cluster signals, which can represent more than 60 gray levels, can then be reproduced by means of several hard-copy printers. The method stems from the old "stipple" method of creating gray levels by altering the spacing of pinpricks in a metal plate. In recent years, Alexander Alexeieff used the same scheme in his pinboard animation films.

The advantage of the Cambridge method is that high-quality, cheap, hard-copy prints can provided quickly. It is claimed that an X-ray or ultrasound picture produced by this means should cost less than 10% of an equivalent polaroid picture. The image fragment shown on the following page is part of a 7½ x 7-in picture of a jazz saxophonist. In all, there are 93 million scanned dots in the picture, each about 1/8mm in diameter. The system might be widely applicable wherever cheap but high-quality pictures are desired.

Nicholas A. Bond, Jr.

ONR London

EARLY PREDICTION OF SCHIZOPHRENIA

One of the best predictors of schizophrenia is a close relative who is schizophrenic. In western countries, about 15% of those whose parent had the disease will be classified as schizophrenic sometime in their lives, compared to a risk of less than 1% for the general population. And if one twin of an identical-twin pair is schizophrenic, there is at least a 30% chance the other will be so affected. Such data suggest a strong genetic component to the disease, but authorities are not agreed on the genetic mechanisms involved or on the fraction of variance due to environment. Furthermore, recent replications of "separated-twin" studies show weaker "schizophrenic family" relations than those reported in Kallman's classic work of 40 years ago.

At York University in the UK, Prof. Peter Venables recently described two studies that furnish some hope for early prediction of schizophrenia. The technique involves measuring galvanic skin reponse (GSR) to a bleeping tone stimulus. In 1962, Danish children aged 15 were tested; some of them showed an "excessive" response, and some had little or no reponse. Since low GSR response is often characteristic of adult "simple" schizophrenics, one might expect that the measurements would be correlated to adult clinical status. And indeed they were: at a 10-year follow-up in 1972, those who had shown abnormal test patterns earlier were significantly more likely to be schizophrenic.

A much larger study, sponsored by the World Health Organization in 1972 tested 1,800 Mauritius children at the age of 3; of that number 200 were identified as either hyperactive, showing little or no response, or normal. Some years later, children in the two abnormal response groups have been rated independently by teachers as less assertive and aggressive than the normals. In 10 more years, the children will be in their mid-twenties, when schizophrenic develcpment is at its peak likelihood, and further follow-up will be done.

If the results stand up and early prediction of later schizophrenia is indeed possible, there are some further difficult questions regarding the treatment of those predicted early in life to be at high risk. Perhaps some attempt at controlling the home environment of high-risk children would be worthwhile, as it is already known that institutionalization of such susceptible children increases the likelihood of later schizophrenia.

Nicholas A. Bond, Jr.

ONR London

TALKING BOOK FROM EINDHOVEN

For teaching dyslexic children, or for all people learning a foreign language, it is important to provide the correct pronunciation of words. Often there is a requirement for many repetitive drill-and-practice sessions. A new "talking book" device, produced at the Institute for Perception Research in Eindhoven, The Netherlands, codes the sound information in a digital array. Each word takes about 800 bits of code, and this is all crammed into a spot about 8 mm x 17 mm. To use the device, the student puts a spring-loaded lens scanner on the code spot, just under the word. As the scanner moves over the area, the code goes to a speech synthesizer for production of sound. The present version can handle words up to one sec long,

which means that three or four syllables can be synthesized; future versions can be expected to extend this time range. The coding system is based largely on institute research into the discriminability of speech sounds.

Nicholas A. Bond, Jr.

ONR London

DENTAL ROLL COLLECTION OF SALIVA

Changes in salivary flow and ionic content are often measured in research on human performance. For example, there are rhythms in salivary flow rate and composition, and "repetitive-work stress" may be related to salivary potassium level. At the Stress Research Unit at the University of Nottingham, Sue Cox and Tom Cox have standardized a dental roll technique for collecting salivary samples.

By using a "saliometer" and suction cup, very accurate samples of salivation can be obtained, and whole-mouth spitting is another possibility. But both methods have their drawbacks: the saliometer is often impractical for field use, and continual spitting is not agreeable to many subjects. A dental roll method, using Oratex No.2 rolls, was tried at Nottingham, and has been found to give good results.

Subjects rinse their mouths with distilled deionized water; then they insert half of a roll on each side of the mouth, using short forceps. After a suitable time period, the roll is removed with the forceps and placed in a plastic syringe. When the syringe is squeezed, saliva, recovered at rates in the 60 to 80% range, is analyzed. This method yields saliva samples that are clean of debris and suitable for pH and ion concentration analyses.

Trials showed that an 8-min collection period was about right for industrial production-line studies. Ninety percent of subjects will provide enough saliva for analysis within that time. Whole-mouth spitting requires only about 2 min to get testable samples, but again the social acceptability of spitting is lower. Comparison of flow rates, pH, Na concentration, and K concentration on 20 subjects yielded non-significant differences between dental roll and spitting samples. Both the spitting and the dental roll measurement techniques involve some stimulation; for instance, the distention of the jaw by the roll and the mechanical action of spitting.

The Coxes have used the dental roll technique in their studies of occupational work, and there are now enough data to establish rough norms. To give just one illustration, the type of payment schedule the worker has is related to potassium concentration. Women working on a flat-rate scheme had higher potassium levels than those on a bonus schedule, and "afternoon changes" in potassium were also higher for the flat-rate group.

Nicholas A. Bond, Jr.

ONR London

OVERCOAT FOR BANANAS

At Cambridge University's Department of Applied Biology, a new sugar-water coating for fruits has been developed. Called Prolong, the coating reportedly reduces the transport of gases such as oxygen and carbon dioxide across the skin of the fruit; thus, ripening is delayed. Fruits, and especially bananas, could be carried at higher temperatures in ships, thus reducing refrigeration costs and preventing chill-damaged fruit. The fruit also could be harvested later, with likely improvements in flavor.

The treatment is simple and cheap; fruit are dipped and dried. Trials on bananas, apples, and plums have been very encouraging. The biggest trial of all, conducted last year, ended suddenly when a hurricane destroyed the banana plantations on the Windward Islands. But the early results showed good quality of consumer product and impressive cost-effectiveness. For the UK, widespread use of Prolong might mean that Britons could get bananas on Monday mornings. Right now, the high cost of Sunday deliveries and the British practice of stocking only what can be sold in one day means that yes, there are no Monday bananas.

Nicholas A. Bond, Jr.

ONR London

OBITUARY

Dr. Seymour Hess, who was a liaison scientist at ONR London in 1971-1972, died on January 15. We extend condolences to his family. Hess was chairman of the Department of Meteorology at Florida State University and also served as the leader of the meteorological scientific team Viking at NASA. He was awarded NASA's medal for exceptional scientific achievement in 1977 for his work in connection with the 1976 space probe to Mars.

ONR COSPONSORED CONFERENCES

ONR London can nominate two registration-free participants in the conferences it supports. Readers who are interested in such participation should contact the Chief Scientist, ONR London, as soon as possible.

General Conference on Condensed Matter, Univ. of Manchester, UK, 22-25 March 1982.

Symposium on Halide & Other Non-Oxide Glasses, Cambridge, UK, 23-25 March 1982.

International Conference on Forward Swept Wing Aircraft, Univ. of Bristol, UK, 24-26 March 1982.

Conference on Optical Techniques in Magnetic Resonance, Hull, UK, 31 March - 2 April 1982.

International Meeting on Analysis of Sample Survey Data & Sequential Analysis, Jerusalem, Israel, 14-18 June 1982.

IXth IUPAC Symposium on Photochemistry, Univ. of Pau, France, 25-31 July 1982.

EUROPEAN VISITORS TO THE US SUPPORTED BY ONR LONDON

Visitor	Affiliation	Navy Lab./Org. to be Visited
Dr. J.C. Bennett	Dept. of Electronics and Elec. Engr., Univ. of Sheffield, UK	NOSC, San Diego (March or April 1982)

ONRL REPORTS

C-12-81

The Biological Effects of Nonionizing Radiation, by J.B. Bateman

This is a critical report on the L.H. Gray Memorial Conference held in Oxford, 13-16 July 1981. The Conference was entitled "Biological Action of Radiofrequency, Microwave and Ultrasonic Radiations." The report provides a background identifying the field of interest in broader terms, intended for the general reader. It is then pointed out that the conference was mainly directed toward research and practice related to the possible value of nonionizing radiations in cancer therapy. There were, however, tutorial lectures of a fairly general character and some discussion of biological effects not necessarily arising from production of heat in irradiated tissues.

C-13-81

Fifth International Biodeterioration Symposium, Aberdeen, Scotland, 7-11 September 1981, by E.C. Haderlie

The meeting covered most aspects of biodeterioration ranging from the degradation of library materials to woods, metals, petroleum products, and wool. Biodeterioration was defined as the degradation of materials as a result of the activities of living organisms.

R-6-81

Polymer and Surface Science in Europe, Israel, and Egypt: Some Observations, by W.D. Bascom

This report contains the author's observations relating to polymer and surface science research activities in European and Middle Eastern countries with emphasis on the quality and quantity of research and the directions research efforts are taking. The information was obtained in visits to university and industrial laboratories and government research organizations over a period of 21 months.

ESN 36-1 (1982)

Now that all ONRL Technical and Conference Reports published during 1980 and available for unlimited distribution have been accessioned by the Defense Technical Information Center, we are pleased to provide this index. Copies of these reports may be obtained from either the Defense Technical Information Center, Cameron Station, Alexandria, VA 22314, or the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161, by using the listed AD number.

COMPUTER SCIENCES		
C-5-80	R.E. Nance	Simulation '80 Symposium (AD-A093488)
ELECTRONICS		
C-11-80	G.M. Sokol	Report on the International Conference on Radio Spectrum Conservation Techniques, London, 7-9 July 1980 (AD-A096675)
ENERGY		
R-2-80	R.E. Machol	Energy from the Bowels of the Earth - Vulcanism and its Uses in Iceland (AD-A093273)
ENGINEERING		
C-6-80	T.C. Cheston & D.K. Cheng	U.R.S.I. - Symposium 1980 on Electromagnetic Waves (AD-A093641)
R-8-80	D. Casasent	Optical Data Processing in Europe (AD-A099043)
R-9-80	T.C. Cheston	Area Report - Developments in Microwave Antennas and Applications in Sweden, Denmark, and Norway (AD-A098572)
MANAGEMENT		
R-3-80	J.G. Hunt	Key Organizational Management and Research Thrusts in Europe (AD-A095955)
MATERIAL SCIENCES		
C-4-80	H. Herman	9th International Thermal Spraying Conference, The Hague, 19-23 May 1980 (AD-A093284)
C-7-80	T.R. McNelley	International Union of Theoretical and Applied Mechanics: 3rd Symposium on Creep in Structures (AD-A097420)

C-8-80	E.C. Haderlie & R.C. Tripper	5th International Conference on Marine Corrosion & Fouling (AD-A096748)

OCEAN SCIENCES

C-3-80	CDR C.H. Spikes	OCEANEXPO '80; Bordeaux, France (AD-A088895)
C-13-80	P. Twitchell	Climate and Offshore Energy Resources (AD-A097774)
R-1-80	W.V. Burt	Climate Variations and Variability: Facts and Theories (AD-A087654)
R-4-80	W.V. Burt	Marine Science in Southern Wales (AD-A093678)
R-5-80	W.V. Burt	A Partial Review of Marine Science in Western Europe (AD-A108779)

PHYSICAL SCIENCES

C-1-80	Dr. L. Slifkin	3rd Europhysical Conference on Lattic Defects in Ionic Crystals, 17-23 September 1979 (AD-A084221)
C-2-80	J.C. Carter	A Report on the Fifth International Symposium on Nuclear Quadrupole Resonance Spectroscopy, held at the Laboratoire de Chimie de Coordination du CNRS Toulouse, France, 10-14 September 1979 (AD-A089917)
C-9-80	J.R. Neighbours	Second International Conference on Superconducting Interference Device and Third Workshop on Biomagnetism (AD-A096749)
C-10-80	J.R. Neighbours for D. Papaconstantopoulos & B. Klein	Meeting on the Physics of Transition Metals, Leeds, UK, 18-22 August 1980 (AD-A096734)
R-6-80	R.S. Hughes	Laser Research in Ireland, Germany, and Austria (AD-A098573)

PSYCHOLOGY

C-12-80	J.G. Hunt	European Workshop in Leadership and Managerial Behaviour-University of Aston Management Centre (AD-A098352)
C-14-80	M.J. Farr	16th International Symposium on Applies Military Psychology (AD-A106691)

RESEARCH POLICY

R-7-80	W.J. Condell	Research Policy in the Federal Republic of Germany (AD-A095275)